



Date: January 30, 2004

TO: Biomedical Research and Development Price Index Distribution List

FROM: Economist, Office of Science Policy, Office of the Director, NIH

SUBJECT: Biomedical Research and Development Price Index: FY 2003 Update and Projections for FY 2004-2008

Summary

- The Bureau of Economic Analysis (BEA) in the U.S. Department of Commerce calculated a 4.6 percent increase in the Biomedical Research and Development Price Index (BRDPI) for FY 2003. This increase is larger than the 3.1 percent increase NIH projected for FY 2003 in December 2002. The major reason for the discrepancy between the predicted and actual growth in the BRDPI was an unexpected surge in the growth of the BRDPI relative to the general rate of inflation. The spread between the growth in the BRDPI and growth in the Price Index for the GDP exceeded the historical average.
- NIH projects the BRDPI to increase by 3.8 percent per year for FY 2004; 3.5 percent during FY 2005 and FY 2006; 3.7 percent during FY 2007; and by 3.8 percent for FY 2008.
- The projections for future year values are prepared in the Office of Science Policy (OSP), NIH. Further inquiries should be directed to my office (phone: (301) 496-2229; email: js41z@nih.gov).

Definition of the BRDPI

The BRDPI measures changes in the weighted-average of the prices of all the inputs (e.g., personnel services, various supplies, and equipment) purchased with the NIH budget to support research. The annual change in the BRDPI indicates how much the NIH budget would need to change to maintain purchasing power—to compensate for the average increase in prices and to maintain NIH-funded research activity at the previous year's level.

The BRDPI was developed and is updated annually by the Bureau of Economic Analysis (BEA), Department of Commerce, under an interagency agreement with the NIH. This year, the BEA updated the BRDPI through FY 2003. The weights used to construct the index reflect the actual pattern (or the proportion) of total NIH expenditures spent on each of the types of inputs purchased (e.g., personnel services, various supplies, and equipment). In the attached table, the values of the BRDPI for 1991-2003 are constructed

using the 1993 expenditure weights; the 1986-1990 values are based on 1988 weights; and the 1979-1985 values are based on 1984 weights. The pre-1979 values of the BRDPI were estimated using a preliminary methodology with a less-detailed set of expenditure weights. The pre-1979 values are not likely to be as accurate as the later year values.

To overcome the well-known problem of substitution bias, BEA staff recommended the use of all three of the available sets of expenditures weights rather than using only one set of weights over the entire post-1979 period. Substitution bias results when comparisons of prices over several years are made using a fixed set of weights which are based on the composition of expenditures in a single, specified base year. The fixed-weight comparison implicitly assumes that the composition of expenditures does not change over time. In periods close to the base year, differences in the composition are usually fairly small, and a fixed-weight index provides a good approximation of price change. Farther away from the base period, however, larger differences in composition are likely. This substitution bias generally causes an overstatement of price increases for periods after the base year and an understatement of price increases for periods before the base year. Weighting formulas that allow for changes in composition over time (such as those used by the BEA) provide a better measure of both year-to-year price changes and long-term trends.

Annual values of the BRDPI can be found on the NIH website at http://www1.od.nih.gov/osp/ospp/ecostudies/economic_studies.htm. Or use the NIH search engine to find “BRDPI.” The BRDPI table will be updated as new values or revisions become available.

The 2003 Update and Projections for FY 2004-2008

Each December the BEA provides an estimate of the BRDPI for the most recently completed Fiscal Year. This estimate is referred to as “preliminary” because the initial data on prices available to the BEA are often revised later in the year. Consequently, each year the BEA also provides a revised estimate for the Fiscal Year before last. This year, the BEA estimated a 4.6 percent increase in the BRDPI for FY 2003. Based on final data, the BEA maintained the estimated BRDPI increase for FY 2002 at 3.6 percent. OSP projects the BRDPI to increase by 3.8 percent per year for FY 2004; 3.5 percent during FY 2005 and FY 2006; 3.7 percent during FY 2007; and by 3.8 percent for FY 2008.

BRDPI projections reflect two considerations. The first is the expected general rate of inflation of prices for the U.S. economy. The second is the expected relationship between the general rate of inflation and changes in the BRDPI. For the general rate of inflation, NIH depends on the U.S. Office of Management and Budget (OMB) projections of the annual rate of growth of the price index for the Gross Domestic Product (GDP). In December 2003, as part of the preparation for the FY 2005 President’s Budget, the OMB projected the annual rate of growth of the GDP Price Index to be 1.3 percent for FY 2004 and FY 2005; 1.5 percent for F2006; 1.7 percent for FY 2007; and 1.9 percent for FY 2008. By comparison, the change in GDP Price Index was

1.5 percent in FY 2003.

The historical relationship between the BRDPI and the GDP price index is summarized by a statistically estimated linear equation that relates the annual percent change in the BRDPI to the annual percent change in the GDP price index. Using the most recently available data for annual changes between FY 1979 and FY 2003 the estimated equation is:

$$\text{(Projected annual percent change in the BRDPI)} \\ = 2.17 + 0.87 \times \text{(annual percent change in GDP Price Index)}.$$

Forecasting the future path of price changes is an inherently imprecise exercise. We cannot expect OMB projections to be correct each year. Likewise, because the complex relationship between the general rate of inflation and the BRDPI increase is summarized with a simple linear equation, year-to-year errors are inevitable. However, we expect an unbiased process – i.e., the projections miss high as frequently as they miss low.

If we believe the historical relationship will hold for any future year, we simply plug the OMB forecasted value for the change in the GDP price index into the equation above and derive the projected value of the increase in the BRDPI. However, for FY 2004 we doubt that the spread between the BRDPI change and the change in the GDP price index will match the historical pattern embodied in the equation. The 4.6 percent increase in the BRDPI for FY 2003 reflects a much higher than average spread above the change in the GDP Price Index. We do not expect the higher spread observed for FY2003 to persist at the same level during FY 2004. Nor do we expect the rate of increase in the BRDPI during FY 2004 to decrease enough to completely re-establish the historical average spread.

Consequently, we believe a 3.8 percent growth for the BRDPI during FY 2004 is a more reasonable projection than one based on the estimated equation. This projection reflects what we believe is a more reasonable (though admittedly approximate) assumption that during FY 2004, the wider than average spread observed during FY2003 will shrink halfway back to the historical average spread between the BRDPI and the GDP price index. The projected 3.8 percent rate for the BRDPI is also adjusted to incorporate the effects of the OMB projected reduction in the rate of general inflation. OMB projects growth of the GDP price index to be 1.3 percent for FY 2004, down from the 1.5 percent observed in FY 2003.

The annual rate of increase in the BRDPI is projected to fall to 3.5 percent during FY 2005. The projected rate reflects the assumption that the above-average spread observed during FY 2003 will continue to regress towards the average historical spread. Thus, although the OMB projects the 1.3 percent growth of the GDP price index during FY 2004 to persist at the same rate during FY 2005, the BRDPI falls from 3.8 percent to 3.5 percent.

By FY 2006, we assume that the growth in the BRDPI reverts completely back to the historical relationship with growth in the GDP price index. The estimated equation is used to project growth in the BRDPI of 3.5 percent during FY 2006; 3.7 percent during

FY 2007; and 3.8 percent during FY 2008. These rates correspond to the OMB projected growth for the GDP price index of 1.5 percent, 1.7 percent and 1.9 percent, respectively for those years.

While more aggressive than following the historical relationship between the BRDPI and the GDP Price Index, we believe the projections for FY 2004 and FY 2005 remain relatively conservative and defensible given the BRDPI growth pattern in recent years. For one thing, the estimated equation projects a relatively small change in the BRDPI for FY 2004 compared with actual BRDPI values realized over the past five years.

Several factors could contribute to keeping the FY 2004 increase in the BRDPI at a rate higher than predicted by the above equation. Increases in academic salaries will likely continue to exceed the rate of inflation, as measured by the Consumer Price Index. Increases in health spending tend to increase employer contributions for insurance premiums and, by so doing, put upward pressure on fringe benefit rates. Also, the gradual upward creep in the average of the indirect cost rates negotiated with academic institutions is likely to continue and, thus, contribute to a higher rate of growth in the academic indirect costs component of the BRDPI. Increases in academic salaries, in the prices for fringe benefits, and in the indirect cost rate together represent a major share of the weighted prices used to compute the BRDPI.

Table A includes values of the annual percent change in the GDP price index and the BRDPI for fiscal years 1980-2003. Table B includes NIH's projected values of the BRDPI and the GDP price index for the years FY 2004-FY 2008.

For the convenience of the reader, Table C illustrates how to translate annual changes into annual levels of the BRDPI. After designating a reference year, for which the value of the BRDPI is specified as 100, projections of the annual levels of the BRDPI can be constructed using the following simple recursive relationship:

$$\text{BRDPI (for year } t) = \text{BRDPI (for year } t-1) \times [1 + \{\text{Annual Percent Change (for year } t)\}]$$

In Table B, the calculations are presented for the years 1994-1996 using the reference year 1993 = 100. To calculate the value for FY 1996, for example, the formula would be: $110.2 = 107.5 \times 1.026$. In other words, to derive the BRDPI value for FY 1996 (110.2), start with the FY 1995 BRDPI value (107.5) and multiply by one plus the annual change for FY 1996 ($1 + 2.6/100 = 1.026$).

James A. Schuttinga, Ph.D.

Attachments

	TABLE A	
HISTORICAL ANNUAL PERCENT CHANGES		
Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
1980	8.8%	9.8%
1981	9.8%	10.4%
1982	6.8%	8.6%
1983	4.4%	6.2%
1984	3.7%	5.9%
1985	3.2%	5.6%
1986	2.3%	4.2%
1987	2.6%	5.3%
1988	3.1%	5.0%
1989	3.9%	5.2%
1990	3.7%	5.5%
1991	3.7%	4.8%
1992	2.5%	4.4%
1993	2.3%	3.4%
1994	2.2%	3.9%
1995	2.1%	3.5%
1996	1.9%	2.6%
1997	1.7%	2.8%
1998	1.2%	3.4%
1999	1.3%	3.7%
2000	2.0%	4.3%
2001	2.3%	4.2%
2002	1.8%	3.6%
2003	1.5%	4.6%

	TABLE B	
PROJECTED ANNUAL PERCENT CHANGES		
Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
2004	1.3%	3.8%
2005	1.3%	3.5%
2006	1.5%	3.5%
2007	1.7%	3.7%
2008	1.9%	3.8%

		TABLE C				
Conversion of Annual Changes into Annual Levels						
Fiscal Year	Annual Percent	[1+(Percent Change/100)]		Previous Year		Annual Level
	Change			Value		BRDPI
Col.(1)	Col.(2)	Col.(2)		Col.(4)		Col.(3)
1993						100.0
1994	3.9%	1.039	x	100.0	=	103.9
1995	3.5%	1.035	x	103.9	=	107.5
1996	2.6%	1.026	x	107.5	=	110.2